Merced River Salmon Habitat Enhancement Project Phase III - Robinson Reach

Final Engineering and Construction Report

August, 2002

California Department of Water Resources
San Joaquin District
River Management Section

A Joint Project between the California Department of Water Resources and the California Department of Fish and Game in cooperation with: the Delta Pumping Plant Fish Protection Agreement (Four-Pumps), CALFED Bay Delta Program, U.S. Fish and Wildlife Service, CVPIA-AFRP, Tracy Fish Mitigation Agreement, Bureau of Reclamation, the Integrated Storage Investigations Fish Passage Improvement Program, and Robinson Cattle Co.

Photo by DWRSJD

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Robinson Reach (Phase III) Construction Report

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Bureau of Reclamation
Tracy Fish Facility Direct Loss Mitigation Agreement
Integrated Storage Investigations, Fish Passage Improvement Program
Robinson Cattle Company

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Introduction

Phase III (second construction phase) of the Merced River Salmon Habitat Enhancement Project (MRSHEP) began construction on July 11, 2001. The MRSHEP, as a whole, involves habitat enhancement and restoration of approximately 4.5 miles of the Merced River centered about the Highway 59 crossing. Phase III includes the portion that is upstream (east) of the highway bridge—a little over two miles of river length.

Preliminary design for this phase of the project began in 1995, with final design work completed during 1999 and 2000. Details of the design and objectives for the project can be found in the engineering report published in 2001 by the Department of Water Resources, titled "Merced River Salmon Habitat Enhancement Project Phase III – Robinson Reach Engineering Report". In general, the purpose was to recreate a channel and floodplain system in a reach which had been significantly altered by extensive aggregate mining from the early 1900's through the 1980's, and made significantly worse during heavy flooding in 1997. These forces combined to create a section of river unlike what typically might be found in a stream with the slope and substrate characteristics of this reach. While attempting to restore this section of river to one which will be reasonably self-sustainable, the designers hoped to create a river more favorable to endemic species such as Chinook salmon and other native fish, as well as to native riparian plants and animals.

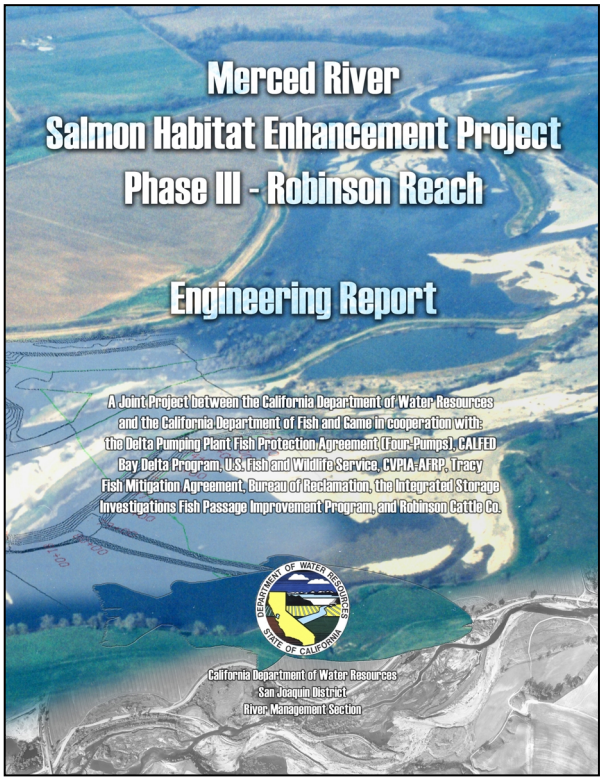

Figure 1 - Engineering Report

Statistics

Construction of the project began in July 2001 and was completed in February 2002. During that time, the 310 acre site was transformed by the movement of between 850,000 and 1,000,000 cubic yards of on-site material. It was redistributed to realign or modify 11,600 feet of river channel and create a floodplain between 700 and 1,600 feet wide. To accomplish that task, several ponds were filled with of up to ten feet of material borrowed from abandoned point bars, which were in turn excavated to floodplain elevation. In addition, 60,000 cubic yards of graded gravel, properly sized for mobility in the design channel under the current flow regime, was produced on-site. The gravel was placed in the design channel on constructed point bars and riffles and in portions of the unmodified channel, and was also placed in a stockpile for future gravel augmentation use.

The total bid estimate by the contractor who was awarded the project was $2,736,000. Actual costs for contract items ended up at about $2,635,000, and extra work items totaled approximately $1,000,000, for a total cost of about $3,635,000.

Construction

There were essentially three overlapping phases of construction. The first was the initial cut and fill of the site, which included filling all of the low areas and ponds with material taken from the borrow sites. The second phase involved creating the new channel using specified select and graded gravel materials. The third phase included forming floodplain details and bringing the entire floodplain area to design grade.

Initial Cut/Fill

Figure 2 – Culvert Crossing Construction

The initial cut and fill of the project area began on the first day of construction, July 11th, 2001. As levees began to be excavated, culvert crossings also began to be constructed to provide access to all areas of the project (Figure 2). Three crossings were eventually installed, each in areas where the existing river channel crossed the design channel. The crossing at station 88+00 was the first to be constructed, followed by one at station 31+00 and another at 115+00 (see Appendix A, Sheet A1). These crossings became essential in keeping the river as clean as possible during construction. Cut and fill work began near the 88+00 crossing and worked downstream along the levees and former river channel (see Appendix B, Sheet B1). During the month of July, much of the levees and abandoned channel area from 88+00 to 111+00 were transformed into rough floodplain, but work by then had begun in several other areas of the project as well. After the crossings were functional, work began on the remaining levee system throughout the project. Levees were reduced to floodplain elevation and the material was used to fill nearby low areas. At the same time, the push to fill a large flat area between stations 32+00 and 72+00 began, and by the end of the month the gravel screening plant became operational. The contractor set up the plant on the point bar near station 27+00 and began screening spawning sized gravel to be used later in the design channel (Figure 3).

Figure 3 – Gravel Screening Plant

In August, the remainder of shallow wet areas near the Hwy 59 bridge were filled, and part of the large, deep pond on the south side near station 79+00 was filled, but the majority of the contractor's work centered on filling between stations 32+00 and 72+00. They left a narrow channel through this section for the existing river to flow, which made filling each side a separate operation (Figure 4). At the same time, the contractor began excavating a large portion of the abandoned point bar upstream of station 32+00, referred to as "Borrow Site 2", and the terrace on the south side of the project between stations 45+00 and 50+00 (Borrow Site 3) (see locations in Appendix A, Sheet A1). They used the material from both sites to fill the low areas mentioned above and to supply the gravel screening plant.

Figure 4 - Floodplain Fill and Existing Channel

By September, much of the general fill work was complete. Borrow sites 2 and 3 continued to be excavated to produce material to fill the remaining low areas, and the gravel screening plant continued to produce graded material. The large pond on the south side at station 80+00 also continued to be filled occasionally. The existing river channel between stations 90+00 and 100+00 was crowded to the south as much as possible to make room for the design channel work. In addition, the terrace on the north side at stations 90+00 to 110+00, referred to as "Borrow Site 1", began to be excavated to floodplain elevation (Figure 5). Overburden from this area was first moved to the south side of the river and stockpiled on the bluffs between stations 97+00 and 105+00 for later use in filling the adjacent pond. The Borrow Site 1 material exposed when the overburden was removed consisted largely of gravel deposits and was used in the design channel and haul road construction.

Figure 5 - Borrow Site 1 Excavation

Most of the general cut and fill work in October involved filling the remaining ponds and former channel after the contractor diverted the river to the newly constructed channel,

and much of the remaining material in Borrow Sites 1 and 2 was removed and used as fill for the old channel and in construction of the design channel.

Design Channel

The process of channel construction involved three distinct types of work. The first phase was excavation. When engineers determined that the material surrounding a particular reach of design channel was classified as inadequate channel bed material, specifications required the contractor to overexcavate (excavate beyond the final dimensions of the channel). During the second phase, "select material" was placed in the excavated section after engineers inspected the overexcavation grade for volume determination (see Appendix B, Sheet B2). Select material was identified by being mostly made up of coarse alluvial material and was selected by the site engineer. The last phase involved placing graded material in the riffles and point bars of the design channel.

Construction of the channel began in mid-August near the downstream end of the project, station 112+00 (see Appendix B, Sheet B3). Most of the random fill adjacent to the channel in that area, which was necessary before channel excavation could begin, was in place by then. From there, the channel was overexcavated upstream to approximately station 99+00 after engineers determined that inadequate material surrounded the channel (Figure 6). Select material was subsequently placed, and this reach was complete by early September.

Figure 6 - Overexcavation

Excavation of the channel between stations 78+00 and 55+00 began in September. The contractor proposed, and engineers approved, the use of some of the excavated material from that reach as select material for the previously overexcavated reaches. Beneath the select quality material, however, was clay and other fine material that was unsuitable, so engineers required overexcavation of that reach as well.

By the end of September, excavation had begun on most of the channel downstream of station 38+00, but the contractor focused on finishing the section from station 90+00 downstream so that the river could be diverted to the new channel. This step was also required before the large pond near station 108+00 could begin to be filled. By the end of September all of the select and graded material had been placed in that reach. After

Figure 7 – Diversion of River To Design Channel

finish grading the riffles to within tolerance, the section was approved and the river was diverted to the new channel from stations 90+00 to 114+00 (Figure 7).

By that time the contractor had placed most of the select material from stations 42+00 to 81+00, and had begun placing graded material from 54+00 to 78+00. Graded placement from 78+00 to 86+00 was begun in early October, and by October 15th the channel from 55+00 to 90+00 was complete. The river was then diverted to the new channel at station 55+00 after all culvert crossings had been removed and the channel between 88+00 and 115+00 had been completed (Figure 8).

Figure 8 - Diversion at Station 55+00

The last section of channel constructed without water flowing through it was from station 38+00 to 55+00. This reach was complete and approved on October 16th and part of the flow was diverted into the new channel at station 38+00.

The final stage of channel construction, from 24+00 to 38+00, was done in the water under flows of about 700 cfs (Figure 9). Since material quality was high in this reach, inspectors did not require overexcavation, and the section was completed by the deadline of October 31st for in-water work. The backwater channel, which meets the design channel at station 79+50, was completed at about the same time. After the large pond was filled on either side of it, the other end of the channel had to be excavated through the floodplain. The portion which runs through the area of the

Figure 9 – In-Water Work

former pond was left in-situ so that existing vegetation would survive (Figure 11). The last step of construction for the backwater was connecting it to the main channel.

Final Floodplain Grading

Final grading of the floodplain was an ongoing process which essentially started at about the time the design channel was completed. It included not only grading the floodplain to specified tolerances of plus or minus 0.3 feet, but also finishing features such as Simulated Abandoned Channels, the floodplain terrace, and the pond and its islands (Figure 10).

Figure 10 – Portion of Completed Design Pond

A portion of the south side floodplain was ready for an initial check in December, with other portions following over the next two months (see Appendix B, Sheet B4). The contractor planned to finish the south side of the project first and then concentrate on the north side. As initial checks were performed, inspectors reported insufficiencies to the contractor. The last portions of the south side floodplain were approved by mid-February. The north side floodplain checks began in January with the initial check of the northeast floodplain from station 28+00 to 70+00 and approval of the majority of the design pond area. The downstream half of the north side floodplain was inspected in February with final approval of the entire north side on February 27th.